



FACULTY OF PHARMACY

TANNINS

PHYTOTHERAPY

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Tannins

العفص

- **Large group of complex substances.**
- **Widely distributed in plant kingdom.**

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Tannins

- Found in immature fruits.
- Source of acids in fruits.
- Source of energy by oxidation.
- Antiseptic and astringent.
- Prevent damage by insects.
- Binds quickly to precipitate proteins and other organic compounds.
- Finally destroyed or deposited.

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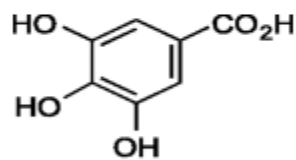
Tannins general characters

- ❖ Not crystallisable.
- ❖ Precipitate solutions of proteins.
- ❖ Antidote for alkaloids poisoning.
- ❖ **Astringent** {tend to contract body tissues}: for diarrhea, for burns and wounds, leather hide.
- ❖ Antimicrobial.
- ❖ Antiulcer.
- ❖ Antioxidant.
- ❖ Anti-inflammatory.
- ❖ Anti-viral.

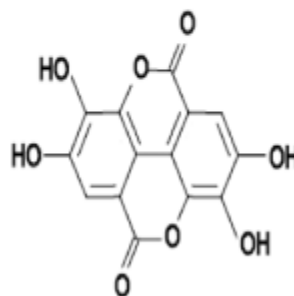
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Biosynthesis of tannins

- From **shikimic acid** and **acetate** pathway.



gallic acid (GA)



Ellagic acid

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Types of tannins

- The tannins divided into 3 subclasses:
 - Condensed tannins or proanthocyanidins,
 - Hydrolysable tannins,
 - Derived tannins



- Condensed tannins
- Hydrolysable tannins

Pseudotannins: simple phenolic compounds present with tannins such as gallic acid, catechins and chlorogenic acid. Accordingly, they have small molecular weights compared to “true” tannins whose molecular weights usually range from 1000 – 5000. ⁹

Types of tannins

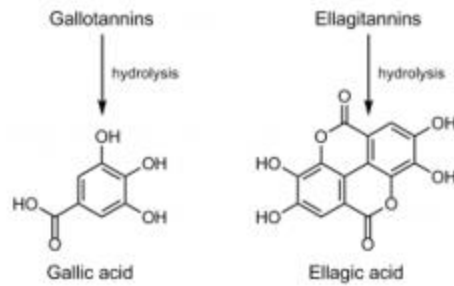
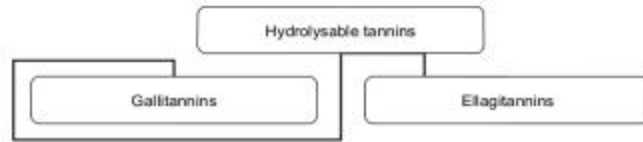
➤ **Hydrolysable tannins:** characterized by phenolic acids like gallic acid or ellagic acid with polyhydric alcohol {sugar alcohols} like glucose i.e phenolic acids esterified with sugars.

➤ Hydrolysable tannins:

1. Pyrogallotannins.
2. Ellagitannins.

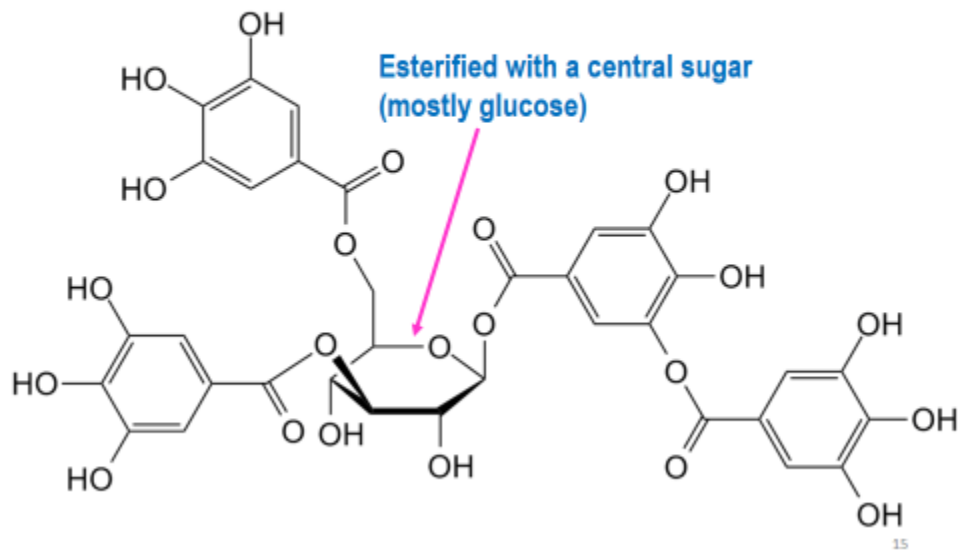
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:Types

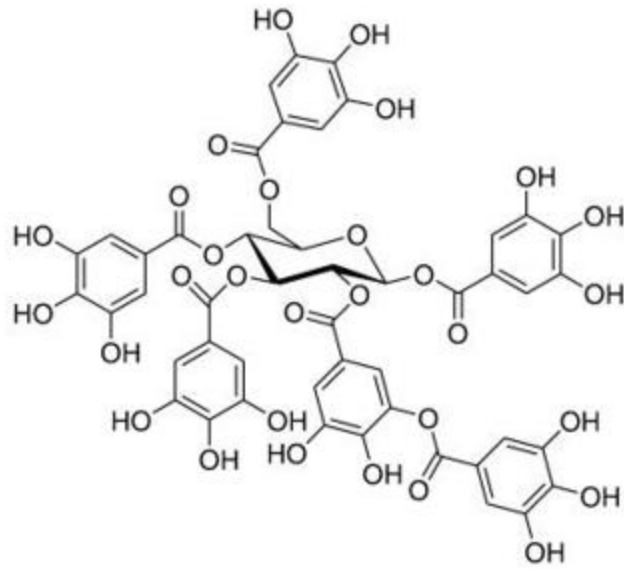


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Hydrolysable tannins



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Hydrolysable tannins

- Example of sources of **gallitannins**:

Rhubarb – clove – red rose petals – bearberry leaves – Chinese galls (*Rhus chinensis* سماق صيني --Turkish galls – hamamilis – chestnut – maple القيقب).



Bearberry



Clove

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Rhus chinensis to produce Chinese galls



Maple

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Hydrolysable tannins

- Example of sources of **ellagitannins**:

Pomegranate rind قشرة and bark – eucalyptus شجرة الكينا leaves – chestnut – oak bark (*Quercus robur*) سنديان / بلوط.



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Ellagitannins



Eucalyptus

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Drugs containing hydrolysable tannins

❖ Nutgall:

- Galls are vegetable growths formed on the young twigs (branches) of the dyer's oak = Aleppo Oak { *Quercus infectoria* } as a result of the deposition of the eggs of the gall-wasp *Adleria gallaetinctoriae*.



Drugs contain hydrolysable tannins



➤ Constituents are:
Gallic acid and tannic acid.

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:Formation of galls

Galls are pathological outgrowth formed on twigs of tree. Galls arise due to deposition of eggs by small insect *Adleria galactinctoria*

;Steps are

Early summers, insects lay eggs on twigs

Larvae come out from eggs and enter soft epidermis

Larvae secrete enzyme that stimulates abnormal growth around larvae

Starch in the tissue gets converted to sugars and stimulate cell division

Disappearance of starch causes cell shrinkage

Generally, galls are used as a source of tannic acid (a hydrolysable tannin of gallic acid and glucose) for tanning, dyeing and ink manufacture.



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Nutgall

➤ Uses:

- Astringent.
- For aphthous ulcer.
- Putrid sore throat



{A condition characterized by progressive necrosis of intraoral tissues and upper respiratory abscesses, which is seen in those with poor oral hygiene and suboptimal nutrition, often linked to herpes simplex and anaerobic flora}.

- Anti-heomorrhagic.
- Burns.




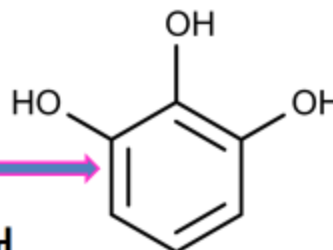
Tonsillitis

Diphtheria

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Characters

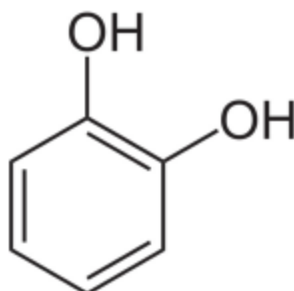
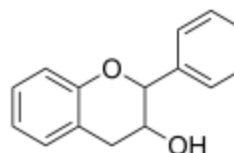
- Yield of pyrogallol. 
- Yield of gallic acid or ellagic acid.
- Yield of color with FeCl_3 {Blue color of the iron salt}.



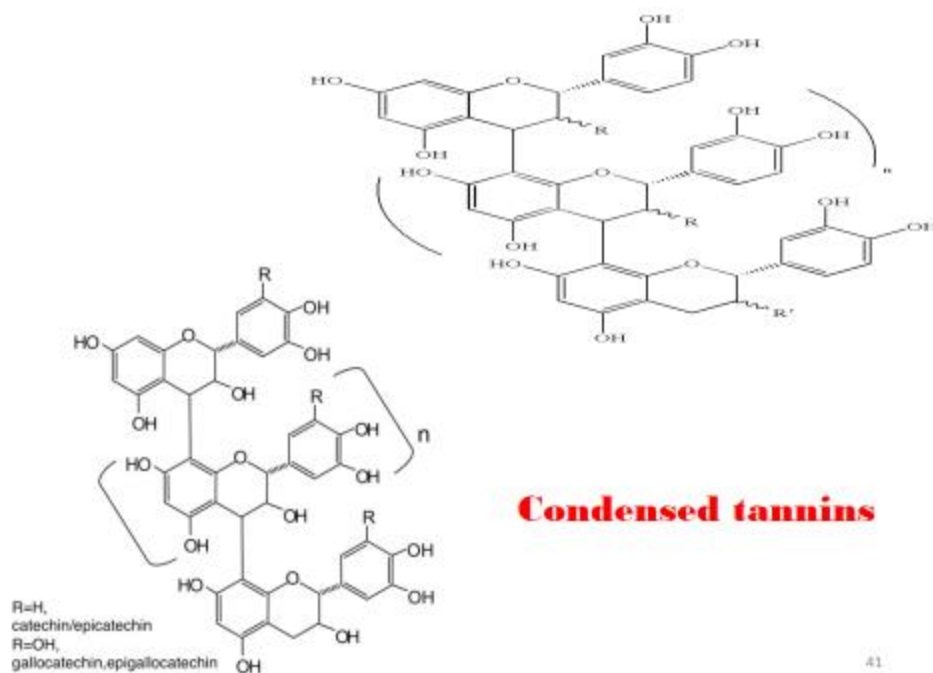
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Condensed tannins

- Not susceptible to hydrolysis.
- Complex structure.
- Consist of polymers of **flavan-3-ol**.
- Catechol tannins.



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Crude drugs rich in condensed tannins

- **Bark:** cinnamon – wild cherry – cinchona – willow – acacia الأكاسيا – oak – hamamelis.
- **Roots and rhizomes:** rhatany.
- **Flowers:** lime and hawthorn.
- **Seeds:** cocoa كاكائو – guarana – kola- areca.
- **Fruits:** cranberry – grapes (red type) – hawthorn.
- **Leaves:** hamamelis – hawthorn – tea (especially green tea).

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Witch hazel

Hamamelis virginiana

- *Hamamelis virginiana* (Family Hamamelidaceae) = Witch Hazel

بندق الساحرة

- It contains: hamamelitannin (a potent oxygen scavenger), v.oil, gallitannins, ellagitannins and proanthocyanidins.

Uses: astringent – anti-inflammatory – therefore is usually used in sprains, bruise and superficial wounds – it is an ingredient in eye lotions.



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عرق إنجبار Tormentil

- Includes about 300 spp. of *Potentilla* – family Rosaceae.
- A perennial plant widely spread through central and north Europe.



- Used as an **astringent**; internally as anti-diarrheal, and externally for gargles and inflamed mucous membranes.

Hawthorn **الزعرور** *Crataegus monogyna* (Fam.: Rosaceae)

- Leaves, flowers and “false” fruits are all used.
- Constituents: procyanidins (are members of the proanthocyanidin (or condensed tannins) class of flavonoids. They yield cyanidin when depolymerized).

➤ Use:

- Cardiotonic especially in old people. It is devoid of *Digitalis*. It can be used before recourse لجوء to digitalis cardiac glycosides.

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Alchemilla = Lady's mantle عباءة
الكمالية - الخميطة

- The flowering and the areal parts of *Alchemilla xanthochlora* (Rosaceae).
- Contains tannins in form of pyrogallol.
- Ellagitannins such as alchemillin. In addition, it contains flavonoids.

Use:

- Astringent against bleeding and diarrhea.
- A long traditional use in gynecological conditions such as menorrhagia غزارة الطمث .

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Rhatany - الرطن - كرامريا

- The dried root of *Krameria triandra*.
- The tannins of *Krameria* are entirely of the condensed type (proanthocyanidins).

Uses: astringent and anti-microbial, therefore it can be employed in the treatment of mouth and throat infections.



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Chestnut leaves

- *Castanea dentata* {Family Fagaceae **الفصيلة**
الزانية أو البلوطية أو فصيلة الزان}
- **Constituent:** tannic acid.
- **Uses:** astringent.



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Green & black tea leaves

- *Thea sinensis*, {Family Theaceae}.
- **Constituents:** caffeine – tannins (10-24 %) – small quantities of theobromine, theophylline and volatile oil.

Possible beneficial effects:

Owing to the strong antioxidant and free radical-scavenging properties, the possible effects are:

- ❖ Inhibition of angiogenesis, a process involving the growth of blood vessels necessary for tumor growth and metastasis (e.g. limiting growth of colorectal carcinoma).
- ❖ Inhibition of hemochromatosis (iron overload) by inhibition of iron absorption by tannins and other ligands.

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- ❖ Treatment of blindness caused by diabetes.
- ❖ Lowering of the risk of ischemic heart disease in older men, and generally reducing mortality due to cardiac disease.
- ❖ Reduction of cognitive impairment.
- ❖ Reduction of obesity.

Identification tests of tannins

With FeCl₃:

Hydrolysable tannins: **Blue** color.

Condensed tannins: **Green** color.

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